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AUTHOR Norwood, Glenda R.
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ABSTRACT

In addition to identifying the causes and physical effects of various nutritional deficiencies, this discussion describes the effects of each deficiency on the learning process. The recommended daily food intake for children and teenagers is also noted. Eight types of nutritional deficiency are discussed in detail: (1) malnutrition (both marasmus--calorie deficiency and kwashiorkor--protein deficiency); (2) protein excess; (3) hyperkinesis (hyperactivity--possibly related to food additives); (4) sugar excess; (5) lead poisoning; (6) iron deficiency; (7) vitamin deficiency; and (8) hunger. Other problems discussed are the effects of not eating breakfast and the effects of increased stress. Finally, some information is given on changes in federal programs that help alleviate nutritional problems of low income children. Parents and health and education practitioners are encouraged to strive to improve children's nutrition. (CB)

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The Relationship of Health and Nutrition
To The Learning Process

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Dr. Glenda R. Norwood

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The Relationship Of Health and Nutrition To The Learning Process

It is an accepted fact that the consumption of an adequate diet, both in quantity and quality, is a main factor to the health and well being of all individuals from the moment of conception until death. Not only is proper nutrition essential for physical growth, but it serves as a basic requirement for proper development of the brain and all mental abilities in humans. How one feels, thinks, and perceives the world is influenced by dietary intakes (Martin and Martin, 1982). Thus, the study and understanding of science and nutrition is an issue of much importance. Figure 1 below denotes the recommended daily food intake for children. The purpose of this paper is to identify nutritional deficiencies and the effects of each on the learning process.

Figure 1
Recommended Daily Food Intake

<u>Milk</u>	<u>Meat</u>	<u>Fruits Vegetables</u>	<u>Breads Cereals</u>
(Children 0-9) 2-3 cups	2 or more servings	4 or more servings	4 or more servings
(Children 9-12) 3 or more cups			
(Teenagers) 4 or more cups			
Provides: Calcium Riboflavin Vitamin A Protein	Provides: Protein Iron B Vitamins	Provides: Vitamin A Vitamin C Iron, fiber	Provides: Carbohydrates B vitamins Iron

Malnutrition:

Malnutrition is often very critical to the developing individual and may be categorized into two types. The first type is severe malnutrition resulting from starvation, and calorie deficiency and referred to as marasmus (ma-RAZ-mus). This is the most widely spread malnutrition problem in the world. Hamilton and Whitney (1982) have identified characteristics of the marasmus child to include:

- (1) appears to be physically skin and bones only, much resembles a wizened little old person
- (2) often sick because resistance to disease is low
- (3) wasted muscles, including vital muscles such as heart muscles
- (4) slow body metabolism resulting in low body temperature
- (5) little fat to insulate against cold
- (6) usually lacking in love and emotional security

Marasmus most commonly occurs in children between six and eighteen months. A child's brain is growing at such a rapid pace that it requires three or four times more energy than the adult brain. To show just how rapidly the brain develops in the early years, twenty-five percent of the adult brain cells are present at birth, sixty-six percent are present by six months, and ninety to ninety-five percent are present by age one (Stevens and Baxter, 1981). This means nutrition is of critical importance during the early years.

Some researchers feel damage done to the brain during this time is irreversible. Since the individual's brain grows to the full adult size within the first two years, marasmus thus impairs brain development and permanently effects learning ability in many cases (Whitney and Hamilton, 1982).

The second type of malnutrition is a protein deficiency disease known as kwashiorkor (kwash-ee-OR-care or kwash-ee-or-CORE). This malnutrition deficiency is most often suffered by newly weaned children whose calorie supply is adequate but are receiving inadequate protein. The individual may retain some body fat but suffers from a metabolic imbalance of protein (Goldsmith, 1980). Whenever a protein deficiency is evidenced, the development of the individual's nervous system and brain are impaired. Thus, kwashiorkor is thought to be a more fatal disease than marasmus.

Freeman (1977) conducted a longitudinal controlled study with over one-thousand three and four-year olds in Guatemala. He found the addition of protein enriched supplement to the diet resulted in a significant difference in cognitive composite scores for memory, recognition, perception, inference, and verbalization.

Protein deficiency is found not only in lower socio-economic homes but is very common in "families who spare no expense to feed their children" (Clark, 1982). These children have less ability to learn, have lower I.Q.s, and have poorer language development than children with sufficient protein diets (Pertz and Putnam, 1982).

Protein excess:

Some children in developed countries eat too much protein, especially meat and milk products. The dangers of over consumption of protein has been discussed by Hamilton and Whitney (1982) to include several dietary precautions. Crowding the diet with too much of any one nutrient results in an inadequate intake of other nutrients, thus introducing a nutritional imbalance that results in illness. Higher intakes of protein require higher intakes of calcium because of the body's loss of calcium by way of excretion. Too much protein can cause dehydration because water is needed to help excrete wasted nitrogen. Maintaining a water balance is essential to the health of one's body.

Hyperkinesis:

Hyperkinesia is a medical term to describe the symptoms of hyperactivity. Hyperactivity is a more common term that generally refers to any number of undesirable behaviors ranging from noisiness to any mischievous behavior (Hamilton and Whitney, 1982). Common symptoms of hyperkinesia may include motor restlessness, short attention span, poor impulse control, learning difficulties, and emotional instability.

It is estimated that approximately five to ten percent of school age youngsters experience hyperkinesia. One or two children in a classroom of twenty children may be hyperkinetic.

There have been numerous theories over the past two decades as to why certain children are hyperkinetic. Many believe food intake affects behavior. Stronck (1980) associated the intake of refined sugars and white flour to aggressive behavior. It may be noted that an abundance of these two foods in an individual's diet, or an over supply of any food, would restrict the intake of other foods containing essential vitamins, minerals, amino acids, fatty acids, and fiber. Schoenthaler's longitudinal study (1983) focused on replacing sugar and junk foods with more nutritious foods in 276 juveniles. He noted over a two year period of time an increase in desirable behavior in this age group. Hamilton and Whitney (1982) also focused on such foods causing allergies in the child. They noted protein foods such as wheat, egg whites, and milk often produce antibodies against specific proteins in foods.

Food colorings, as a cause for hyperkinesis, has been a major concern for several decades. Approximately ninety percent of processed foods contain artificial colors and flavors (Stronck, 1980). Dr. Feingold (1975) researched salicylates (sa-liss-uh-lates) and their relationship to hyperkinetic behavior in individuals. Salicylates are compounds resembling aspirin in chemical structure. Tartrazine (tar-truh-zeen), a food coloring (Yellow No. 5) is a salicylate. Dr. Feingold's recommendation that salicylates be restricted from the diet resulted in positive results for some children but not for all children. Approximately 1-100 children appear to suffer negatively from Yellow No. 5 dyes in foods. William Crook (1980), a pediatrician

using anecdotal data, also noted a relationship between food dyes and hyperactivity. A double blind study by Dr. Keith Connors of the University of Pittsburg suggested that food dyes might be a factor in hyperactivity (Rapp, 1977).

Monosodium glutamate, better known as Accent, is a saltlike powder used by many cooks to enhance natural food flavors. It is believed that some children, after the consumption of this product, may experience epileptic-like seizures to include numbness of muscles, palpitations, and other adverse symptoms (Hamilton and Whitney , 1982).

Parents of the overactive child must make a decision of proceeding with the child. It is suggested by Hamilton and Whitney (1982) that other factors excluding diet may result in undesirable behavior and should be controlled initially. The child should receive adequate sleep and rest daily, engage in an adequate amount of physical exercise, and be encouraged not to become overstimulated. Television monitoring may result in less excitement for the child. Parents and teachers need to remember that most children are rambunctious at times and this periodic behavior should not result in the child being labeled as hyperkinetic.

If controlling these areas does not result in more desirable behavior, parents may experiment with other controls. All children respond favorably to an environment with ample love and care. These are essential for both mind and body health.

A balanced diet is necessary for proper metabolism of all food

nutrients. This diet must be eaten daily. If adverse behavior persist, parents may begin eliminating specific foods from the child's diet to experiment with foods that may effect behavior. Food additives, refined sugars, white flours, etc. may be considered for removal from the diet. It should be remembered that displaced food intake, due to a large intake of one food may result in lower iron, vitamins, and other nutrient intake. A breakfast of donuts or a lunch of ice cream allows few essential nutrients for body processes and causes the child to experience negative behavior.

If the undesirable behavior continues, the child may need to undergo allergy tests. These are difficult to identify because of the delayed reaction type of allergy of which characterizes 95% of all allergies.

In the event that none of the experimentation proves positive, additional medical assistance is needed. A positive thought for families of such children is that the condition often disappears as the child grows older.

Most medical physicians use one of two drugs to suppress over-active behavior resulting from unknown reasons. These drugs are dextroamphetamine and methylphenidate. Better known brand names for these include Dexedrine, Benzedrine, and Ritalin (Hallaham, 1981). Psychoactive stimulant drugs, such as Ritalin are most commonly prescribed. A new drug, Cylert, is currently preferred by many because it is taken once a day instead of twice daily as are most

other behavior control drugs (Dedman, 1984). If the undesirable⁸ behavior continues, a new look is taken at the child's condition. The use of drugs to control overactive behavior is controversial. Many doctors and parents prefer more natural ways of controlling behavior in children.

Sugar excess:

Sugar excesses in the body may cause additional health problems beyond those associated with hyperkinetic conditions. Many nutritionists believe it an impossibility to separate sugar ingestion from the effects of increased calories and resulting obesity. As the amount of sugar intake rises, total caloric intake rises. Obesity is a likely consequence.

Social and emotional development may decline for obese children. Physical activity usually decreases. A lack of friends and an undesirable physical body in turn lowers self-esteem. A low self-esteem often results in a negative change in the learning process.

Another physical manifestation of obesity may include diabetes. Sugar, as with excess intakes of any one food, displaces other essential nutrients restricted from the diet and is apt to cause multiple health problems as a result. Parents often wonder if all refined sugars should be avoided for the family. Most nutritional experts concur that moderate amounts of sugar included in addition to a well balanced diet would probably not be harmful except for potential diabetics.

Lead levels:

Needleman (Wunderlich, 1981) studied the association of poor scholastic performance with the level of lead in the body. He noted a high correlation between verbal deficiencies, auditory problems, and hyperactive behaviors. Lead in deciduous teeth related to these learning disorders in his study.

Whitney and Hamilton (1982) found that bonemeal contained high lead levels. Bonemeal is found in many vitamins and powdered breakfast drinks. Many canned vegetables today have high levels of lead and should never be fed to infants.

Parents of children reared in environments that contain toys, furniture, or interior/exterior house walls that have paint peeling off the wood should be careful that children not get paint chips into their mouth and system. The Atlanta Journal-Constitution and the Chicago Sun Times, periodically report paint ingestion and resulting health problems because of the high lead level, especially in those paints manufactured prior to the fifties. Current laws prohibit the use of lead in paints. However, many lower socio-economic children continue to live in homes painted with lead toxic paints. No amount of lead in the body is safe and symptoms of lead may include hyperactivity, nervousness, brain damage, and flu-like symptoms such as headaches and vomiting.

Thatcher (1982) and a group of researchers studied the effects of cadmium and lead in children's hair and the relationship to learning. They found evidence that each were significantly correlated

with both intelligence scores and school achievement scores.

Iron deficiencies:

Iron deficient anemia is a common name for decreased hemoglobin levels in the body. The mineral, iron, is necessary to carry oxygen throughout the body, including the brain. If there are deficient levels of iron available, the individual may be unable to appear interested in learning (Goldsmith, 1980). Often this child is labeled as a slow learner and experiences a low level of performance. The child may appear lazy, easily tired, and sometimes dizzy (Whitney and Hamilton, 1982). Iron rich foods from each food group should be eaten daily. Many experts recommend cooking food in iron utensils in order to increase the amount of iron in the food.

Vitamin deficiencies:

Vitamins may be categorized as fat soluble or water soluble. Fat soluble vitamins may be stored in the body cells and one does not have to eat foods rich in these vitamins every day. Vitamin A and D are two fat soluble vitamins that appear to be lacking in many diets.

Vitamin A's function in the body is to maintain the health of the cornea, the outside covering of the eyes. If sufficient amounts of beef liver, pumpkin, greens, carrots, sweet potatoes, and other vitamin A rich foods are not eaten, the eyes may become inflamed and reddened. Xerophthalmia characterizes this condition and visual discrimination is impossible. Good vision is necessary to the reading process.

Abnormal bone development, often as severe as rickets, result

from insufficient intakes of vitamin D. It is recommended that "D" fortified milk be given to children. They should eat many fresh foods grown in the sunlight and be exposed to sunlight in moderation. Dark skinned people make less vitamin D because the pigments of the skin hinder the absorption of vitamin D. Thus, abnormal bone development may result more often.

Water soluble vitamins cannot be stored in the body's cells and must be eaten daily. Excess amounts are flushed from the body during elimination. Vitamins B and C are common water soluble vitamins lacking in many individual's diets. Vitamin B deficiencies may include:

1. thiamin - A disease, beriberi, often is prevalent in children whose diets consist of primarily polished rice and flour products and are lacking in lean pork, liver, legumes, and fresh green vegetables.
2. riboflavin - Deficiencies may result in skin disorders, cracks in the corner of the mouth, red and swollen tongue, and teary eyes. The deficiency is eliminated by adequate amounts of milk, milk products, liver, and heart meat.
3. niacin - Deficiencies are evidenced in locales where predominate diets of corn and low protein intake is common. Pellagra is a deficiency disease and may be characterized by weak muscles, loss of appetite, lassitude, and poor digestive functioning. Enriched breads and cereals are rich in niacin.

Vitamin C rich foods are important for the body in their work with other nutrients to maintain health. Fresh fruits and vegetables provide this vitamin. Many people believe one should rid themselves of a common cold by drinking large amount of fruit juices. The idea is to rid the body of metabolic waste generated by fighting off the cold virus and probably any fluid, even water, would do this job. Excess vitamin C would only be flushed from the body.

Hunger:

Across America, hunger is a growing problem as evidence in 1982-83 data (Children's Defense Budget, 1983). One-half of the 181 emergency food agencies during the period from February 1982 to February 1983 reported a rise in persons seeking emergency food aid. A Massachusetts study found 1-5 low income children to be stunted, anemic, or abnormally underweight. In Chicago during 1981-83, Cook County Hospital experienced a 24% increase in the number of children admitted for failure to thrive, diarrhea, or dehydration - all conditions linked to inadequate nutrition. In New York City, physicians found the average food intake of persons seeking food aid to be 1200 calories per day, a level too low for good health for most people.

Stonck (1980) found that child hunger, even if the child is usually well fed, prevents the individual from performing effectively in concentration activities. Often these individuals are perceived as tired, bored, listless, and/or apathetic. Alder (1982) concluded that children who come to school hungry concentrate more on their physical state than the learning activities they are suppose to be engaged in.

Morning hungeriness resulting from lack of breakfast is experienced by 35-40% of all Americans (Rush Hour Breakfast, 1983). Breakfast provides energy in the morning hours that is necessary to the body functioning properly. Research conducted by the State University of Iowa concluded the individual who eats an adequate breakfast is quicker in actions and can learn more during the late morning hours (Scott, 1983). Nutritionists believe the breakfast diet should provide 1/3-1/4 of the daily food intake. A University of California study included breakfast eating as one of the seven health habits resulting in persons living longer (Milius, 1983).

Stress relationships to nutrition:

Many children live stressful lives due to the changing family structure, financial/economic fluctuations, pace of living, external/internal demands, and an array of other factors. Stress causes a skyrocketing of nutritional needs. Hockberg (1983) cites the following changes stress may produce:

1. reduces the natural immunity to illness, resulting in illnesses and diseases that ordinarily lie dormant
2. lowers the cortisone levels in the blood, that normally protects against inflammation and joint pain
3. causes biochemical upheavals resulting in nutritional deficiencies.

Stressful people thus need more protein and carbohydrates. Emotional stress interferes with fat digestion, thus, a low fat diet is advisable. Water retention is

often a side effect and less sodium foods should be consumed. Caffeine aggravates stress because of its stimulating qualities. The metabolic rate of the stressful individual is increased, more calories are burned up, and the person feels hungry more often.

Summary:

Nutritional deficiencies do relate to learning difficulties in youngsters. All children, in order to do their best work, must eat a daily well-balanced diet that is varied. It must be rich in meat, vegetables, fruits, dairy products, and grains (Seifert, 1980).

Diet is not, however, the only essential element to good health. Physical fitness currently is absent in 57% of youngsters between 6-17 years of age (Dardick, 1983). These individuals were unable to meet standards of fitness regarded as attainable by average healthy children. Current technology requires less physical exertion. Exercise on a daily basis must be balanced with proper sleep and rest if preventive medicine is to be practiced.

Nearly 40% of all poor people in America are children and the number is increasing. Health suffers. Children in low income families are in poorer health (Kover, 1982). The proposed federal government program for 1985 (Edelman, 1984) decreases monetary benefits for the Food Stamp Program. It proposes to repeal the Child Care Food Programs and Summer Food Program. Increases over the 1984 budget are planned for the W.I.C., the Supplemental Food Program, School Lunch Program, and the School Breakfast Program. Currently, the Aid To Families With Dependent Children Program is the largest federal cash

assistance program for poor children and pays an average of \$24.32 per week per person and 70 percent of these persons are children.

In conclusion, an appropriate statement of hope for more healthy children who can learn and be happy is:

"It is never too late, or is it ever too early to supply the the body and mind with a full quota of nutrients. It is never too late to improve the present generation so future ones can better cope with complex problems of society. It is never too late to improve one's diet. By doing so, you and I and our children learn more efficiently what we need in the way of food, nutrient supplements, vision, audition, touch, movement, and cultural stimulation. To that end, we, teachers, parents, educators, medical personnel - must all strive (Wunderlich, Jr., 1981)."

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